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BULLETIN OF
THE GEORGIA ACADEMY OF SCIENCE

Volume XVII April, 1959 Number 2

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PROGRAM NUMBER
THIRTY-SIXTH ANNUAL MEETING
OF
THE GEORGIA ACADEMY OF SCIENCE
MERCER UNIVERSITY
MACON, GEORGIA
APRIL 24, 25, 1959

Local Arrangements Chairman – R. E. Moseley
Mercer University

Georgia Junior Academy of Science Meeting and State Science Fair
University of Georgia, Athens – April 16-18, 1959

BRING THIS PROGRAM WITH YOU TO THE MEETING

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} Assistant Editors

THE BULLETIN of the GEORGIA ACADEMY OF SCIENCE is published four times each year, and is sent without charge to all members of the Academy.

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PROGRAM

FRIDAY, APRIL 24, 1959

Morning

8:00-12:00 Registration; Reservations for Luncheon and Supper
Lobby, Student Center

9:00-12:00 Section Meetings

12:00- 1:00 Luncheon. Cafeteria. Tickets $0.75, purchased at Registration Desk

Afternoon

1:15- 2:15 General Business Meeting of the Academy
314 Student Center

3:00- 5:30 Joint Meeting of all Sections. Symposium, "The Impact of Darwin's Ideas"
314 Student Center

Evening

6:00- 7:00 Informal Supper. Cafeteria Balcony. Tickets $1.00, purchased at Registration Desk

7:00- 8:30 Joint Meeting of all Sections. Symposium, "The Status of the Teaching of Evolution in Secondary Schools"
Cafeteria Balcony

SATURDAY, APRIL 25, 1959

Morning

9:00 Meet for Field Trips, Joint Programs for all Sections
Archaeology Field Trip, to Ocmulgee Mounds, Organize, 212 Student Center (Faculty Club Room)

Geology Field Trip, to Tuscaloosa formation and Clay pits. Organize in Game Room, ground floor, Student Center

JOINT MEETINGS OF ALL SECTIONS

FRIDAY, APRIL 24, 1959 — 3:00 P.M.

Student Center, Room 314

SYMPOSIUM: THE IMPACT OF DARWIN'S IDEAS

W. B. Baker, Moderator

Introduction—Facts, Theories and Hypotheses, W. B. Baker
Experimental Evolution—Cytogenetics, R. H. Fetner, Research Biologist, Georgia Institute of Technology
Anthropology—Evolution in Man, A. G. Smith, Anthropologist, Department of Sociology, Emory University.
Paleontology—Evidence, Pro and Con, H. R. Cramer, Paleontologist, Department of Geology, Emory University
Philosophy—Influence and Effect, Richard Hocking, Professor of Philosophy, Emory University

This symposium is in honor of the centennial of the publication of Charles Darwin's "Origin of Species." The impact of Darwin's ideas upon sciences and upon the thinking of scientific men and women during this century will be presented by the panel, representing the disciplines most directly involved. Consideration will be given to the present status of theories of evolution, and the currently available evidence in support of them.

Questions or discussions from the floor will be in order at the close of each formal presentation.

FRIDAY, APRIL 24, 1959 — 7:00 P.M.

Cafeteria Balcony

THE STATUS OF THE TEACHING OF EVOLUTION IN SECONDARY SCHOOLS

A Symposium Sponsored by Science Education, Section VII

Katherine Hertzka, Presiding

Legal Status—Judge H. O. Hubert
State Viewpoint—State Department of Education
Viewpoint of Parent-Teachers Organization—Knox Walker, Past President, Georgia Congress of Parents and Teachers
Viewpoint of the Classroom Teacher—Arlo Nesmith, Albany High School

JOINT MEETINGS OF ALL SECTIONS

FIELD TRIPS

SATURDAY, APRIL 25, 1959 — 9:00 A.M.

General: Two separate field trips have been planned, one Archaeological, the other Geological. Because both will start at 9:00 A.M. and will last until past noon, it is suggested that each member or guest bring a lunch. Private cars will be used for transportation.

OCMULGEE NATIONAL MONUMENT

Assemble, 9:00 A.M., 212 Student Center

This group will be under the direction of Dr. Lewis H. Larsen, Archaeologist with the Georgia Historical Commission. The group will follow U. S. 129 eastward to the Ocmulgee National Monument. An entrance fee of $0.25 covers the visit to the mounds and to all other archaeological features of the monument.

Ocmulgee was the first scientifically excavated large Indian site in the South. Its mounds and museum stand in the center of fertile hunting grounds where as long ago as 10,000 years Archaic-age Indians wandered over the Georgia Plains. Six successive occupations by different Indian groups have been discovered in the area; an earth lodge used by one of these groups 1,000 years ago has been restored and can be seen much as it was when the tribal council met there. The museum which houses archaeological discoveries from the area is one of the finest educational museums in the United States.

GEOLOGIC FIELD TRIP

Assemble, 9:00 A.M., Game Room, Student Center

The leaders will be geologists from Emory University and the Georgia Geological Survey.

The first stop will be on the north side of Macon, near the intersection of U. S. 129 with Ga. 22 and Ga. 49. There the cross-bedded Tuscaloosa formation (Upper Cretaceous age) is well exposed in angular unconformity with underlying crystalline rocks. A good basal conglomerate lies above the unconformity.

The second stop is at Brown's Mountain several miles south of Macon on State Highway 87. Brown's Mountain is capped by hard, gray quartzite of Eocene (Barnwell) age, and is very fossiliferous.

Next, the group will visit the kaolin mines of Southern Clays, Inc., at Gordon, and observe Georgia's most valuable mineral being mined.

The last stop will be the Weston-Brooker aggregate quarry near Gray. This is one of the largest modern quarrying operations in the state.

At each stop the geologic features will be explained, and field trip members will have opportunity to collect rock, mineral, or fossil specimens.

SECTION I

BIOLOGY

FRIDAY, APRIL 24, 1959 — 9:00 A.M.

206 Biology Building

Elizabeth L. Sawyer, Presiding

The Southern Blue Ridge Province as an Area of Biological Research

THELMA HOWELL, Wesleyan College and The Highlands Biological Station

The Southern Blue Ridge Province is also known as the Southern Appalachians. The area includes the mountain mass south of the Roanoke Gap and covers 10,000 square miles in southern Virginia, western North Carolina, eastern Tennessee, and northern Georgia. The area is one of great antiquity and represents an ancient land mass repeatedly raised into mountains and continuously eroded. During periods of peneplanation,

the vast mountain area became a refuge for plants and animals. Investigators have directed attention to many native species of plants which are thought to represent survivals from early geologic time and to many species and genera which have their nearest relatives at the present time in eastern Asia. Examples of recent types of research problems being conducted in this biologically important area, with the Highlands Biological Station as a base of operations, are presented and the bio-geographical importance of the researches emphasized.

10 minutes 2 x 2 and 3¼ x 4 slides

The Four Seasons in the Southern Blue Ridge Province

THELMA HOWELL, Department of Biology, Wesleyan College, and The Highlands Biological Station

In the Southern Blue Ridge Province, the four seasons are definite. The changing temperature, light, and moisture conditions are reflected in a vivid manner in the forests, as the annual seasonal march progresses. The native flowers characteristic of spring, the green mountains of summer, the colorful display of the hardwoods in the autumn, and the dormant forests of winter are shown by kodachromes.

10 minutes 2 x 2 slides

A History of Black Root Rot of Pine

S. J. ROWAN, U. S. Forest Service, Macon

A root rot of pine seedlings, first discovered in 1936 in Mississippi, has been found in at least seven forest nurseries. Losses as high as 95% of the crop occur in small areas.

Two soil inhabiting fungi **Sclerotium bataticola** and **Fusarium** sp. cause the disease. **Sclerotium bataticola** attacks from without by producing indole-3-acetic acid (a plant hormone) which causes a proliferation of root cells and swollen cankers on the roots. Fusarium decays the roots by direct penetration.

Inoculation studies at differing temperatures have revealed that the disease is most severe at 85° to 90° F.

Control of root rot has been obtained through soil fumigation with methyl bromide.

10 minutes 2 x 2 slides

The Influence of Topography on the Future Composition of Lower Piedmont Forests

JACK STUBBS, Southeastern Forest Experiment Station, U.S.F.S.
(Introduced by A. A. Foster)

Hardwoods, notably various oak-hickory types, originally composed most of the upland forest cover of the Lower Piedmont region. Land clearing for agriculture destroyed the original forest over large areas, and when land was eventually abandoned, the relatively light-seeded pines were able to establish practically pure stands. Secondary succession toward hardwood is taking place in these stands.

A study of the Hitchiti Experimental Forest, near Macon, Georgia, has indicated that the rate of successional change is greatly different in various stands, and the differences are closely correlated to the existing landform or topographic pattern. The success with which pine is able to reproduce is primarily governed by the degree of hardwood competition present, and this depends upon the stand's aspect, position on the slope or topographic pattern, and the degree of slope. Hardwood invasion

has been very slow on the ridge tops and upper gentle slopes. On steeper slopes aspect is very important, northeastern aspects have considerable hardwood present, while southwestern aspects do not. Hardwood increases in intensity with greater slope on all aspects. Lower slopes have more hardwood than upper slopes, regardless of aspect, and the bottoms are almost completely dominated by hardwood.

The intensity of management necessary to purpetuate pine will depend upon this topographic pattern of changing rate of hardwood succession. Therefore it would be profitable and efficient to classify forest land according to this successional pattern.

10 minutes 35 mm. slides

Development of the Ascocarp and the Taxonomy of the Dothioraceae

E. S. LUTTRELL, Department of Plant Pathology, Georgia Experiment Station

A morphological study of an undescribed species of **Dothiora** (Ascomycetes) on **Symphoricarpos orbiculatus** indicates that the asci are bitunicate. The ascocarp originates as an erumpent, pulvinate, pseudoparenchymatous ascostroma in which microconidia and ascogonia develop provided with trichogynes. Ascogenous hyphae, proliferating laterally from the ascogonia, form a flat layer across the basal region of the ascostroma. The asci arise in a continuous palisade and push upward as a group into the single broad locule produced by disintegration of the pseudoparenchyma in the central portion of the ascostroma. At maturity the overlying stromal tissue ruptures and exposes the disc-shaped layer of asci. The Dothioraceae belong in the Subclass Loculoascomycetes. Although they show a superficial resemblance to members of the Hysteriales, the internal structure of the ascocarps indicates that they belong in the Dothideales.

10 minutes 2 x 2 slides

The Leuco-Anthocyanins of Sericea Lespedeza During Ontogeny

ROBERT E. BURNS, Crops Research Division, A.R.S., U.S.D.A., Experiment

The leuco-anthocyanins of Sericea lespedeza (**L. cuneata**) were studied during the life history of the plant by means of paper chromatography. Initial studies on mature leaves showed that the major component is delphinidin while cyanidin is present in lesser quantities. The proportions of these two is the same in all the strains studied and under various environmental conditions. The stems, though having much less of these compounds have them in the same proportion.

In the seed, cyanidin is the major component with very little delphinidin present. Essentially all of this is in the seed coat. No measurable amount was obtained from the embryo. When the seedlings are three weeks old the green cotyledons still have appreciable amount of leuco-anthocyanins. The first true leaves formed have leuco-anthocyanin in lesser amounts but in the same proportion as in the mature leaves.

7 minutes 2 x 2 slides

Size of Forest Openings Affects Growth of Pine Seedlings

L. W. R. JACKSON, School of Forestry, University of Georgia

In 1952, an experiment was started to determine the survival and growth of shortleaf pine (**Pinus echinata Mill.**) and loblolly pine (**P. taeda L.**) seedlings under 6 classes of canopy opening diameters that

increased from 5 to 55 feet by 10-foot intervals. Each class was replicated 5 times. After 5 years, the increment of annual height growth of both species actually decreased under openings of 35 feet or less, whereas it increased rapidly under the 45- and 55-foot openings. Average total length of needle retention per seedling for both species increased from only 4.0 to 25.1 inches as openings increased from 5 to 35 feet, whereas it was 45.0 and 78.0 inches for shortleaf and 54.0 and 111.0 inches for loblolly under the 45- and 55-foot openings, respectively. Stem diameter of shortleaf increased from 5.6 to 10.5 mm. as openings increased to 35 feet, whereas it was 18.4 and 24.8 mm. under the 45- and 55-foot openings. For loblolly, the stem diameter increase was only 9.2 to 14.4 mm. under the 4 smaller openings as compared to 21.8 and 35.9 mm. under the 2 large openings. The marginal light intensity for survival of both species is apparently 30 per cent of full sunlight. The results of this study show that canopy openings of at least 45 feet in diameter are necessary for adequate crown and stem growth of both species.

10 minutes 2 x 2 slides

Differences in Habit and Foliage Exhibited by the Podocarps

NETTA E. GRAY, Department of Biology, Agnes Scott College

The woody plants of the gymnosperm genus **Podocarpus** are found chiefly in the temperate parts of the Southern Hemisphere and on mountain slopes in tropical regions. Over a hundred species have been described in this genus and these range from large forest trees to creeping plants. About 25 species become trees over 100 feet tall which are most valuable for timber; about 25 species are very small trees or entirely shrub-like. In contrast to the needles we know on Georgia pines, the leaves are mostly broad and flat.

The genus has been divided into eight sections and these can be distinguished by differences in leaf characteristics. There may be large ovate or long narrow leaves, short yew-like leaves, and even scale-like leaves. Leaves on lower branches and on vigorous or juvenile specimens are usually larger and differ in shape from mature leaves. Several species have two kinds of leaves as mature foliage. Most species have a single midrib but in one group there are many close parallel veins. Stomata may be on one or both surfaces of the leaves. Hand-cut transverse sections show histological features such as hypoderm, resin canals and accessory transfusion tissue. These are used together with the external features to differentiate the sections.

10 minutes Blackboard

Helminths of Some Fresh-Water Fishes from Bulloch County, Georgia

JOHN G. KELLEY, JR., Georgia Teachers College
(Introduced by Burton J. Bogitsh)

A systematic survey of helminths from 164 fresh-water fishes from a pond in Bulloch County, Georgia was conducted from August, 1958 until November, 1958. Ten species of parasites were collected from the fish hosts during the investigation. Of the four species of fish collected, three species contained parasitic worms. All specimens of **Lepomis m. macrochirus** and **Micropterus salmoides** were parasitized as well as 88% of **Ameiurus nebulosus marmoratus.**

10 minutes 2 x 2 slides

The Incidence of Intestinal Parasites in 58 High School Children of Bulloch County, Georgia

WAYNE EDWARDS and PAUL RUFO, Department of Biology, Georgia Teachers College
(Introduced by John A. Boole, Jr.)

Fecal examinations of 58 children from an all-white high school in Bulloch County, Georgia revealed the following: 7 children harbored **Necatur americanus**, 2 proved positive for **Endamoeba coli**, and 1 child had a severe case of **Enterobios vermicularis**. The total infection for the group was 15.5%, with 11.8% being infected with hookworm.

10 minutes 2 x 2 slides

A Systematic Study of Platyhelminths in Some Anurans of Bulloch County, Georgia

ROBERT G. LITCHFORD and CLYATT W. JAMES, JR., Department of Biology, Georgia Teachers College, Collegeboro
(Introduced by John A. Boole, Jr.)

A systematic study of some anurans in Bulloch County, Georgia was conducted from September to December, 1958. Fifty anurans, belonging to two families and three species, were examined. Of this number 16, or 32 percent, were found to harbor at least one type of flatworm. Five species of Trematoda and four species of Cestoda were recovered. In all of the examinations made, the Bufonidae continually showed negative incidences of trematode infection. Also, one species of Ranidae, **Rana catesbiana**, continually showed negative incidences of cestode infection.

10 minutes 2 x 2 slides

Larval Migration of the Nantucket Pine Tip Moth, *Rhyacionia Frustrana*, and its Application in Control

HARRY O. YATES, III, Entomologist, Southeastern Forestry Experiment Station, U. S. Forest Service
(Introduced by A. A. Foster)

The Nantucket pine tip moth is a particularly difficult insect to control. Attempts at control of this insect by insecticidal sprays are minimized by two factors, the accessibility of the trees to spraying equipment and the insect characteristic of feeding within the host and out of reach of contact insecticides. Work during the past summer has indicated that the larval stage migrates as much as eighteen inches on the outside of the developing shoots. Establishment of this period of migration will make future spraying with contact insecticides more effective.

10 minutes Chart

The Dairy Industry of the United States as Influenced by Bulk Handling of Milk on Dairy Farms

H. B. HENDERSON, Dairy Department, University of Georgia

From a small beginning on some of the larger dairy farms in California in the late 1930's, the handling of milk in bulk tanks on dairy farms of the United States has developed rapidly since the early 1950's. In 1953 only 3,150 tanks were in use, but by 1958 more than 91,000 dairy farms were equipped with bulk tanks. Approximately 50 per cent of the

total supply of milk used for fluid consumption is being supplied by farms with this type equipment.

This system not only removes one of the most laborious tasks of dairy farm operation, but it provides economies for the dairy farmer in increased labor efficiency and reduced hauling charges. In some instances he receives a premium for his milk if he has a bulk tank. The quality of the milk produced on farms equipped with bulk tanks is improved in both flavor and lower bacterial counts.

The dairy plant receiving milk from farms having bulk tanks realizes substantial savings in labor, space and materials, and is assured of a high quality product.

The bulk tank system is better adapted to the larger and more specialized dairy farms. Small farms installing this equipment must increase their production in order to justify the added investment. A farmer who is unable to increase his volume of production sufficiently to justify the the added investment usually is faced with the choice of finding another market for his milk in cans, or discontinuing the production of milk as a farm enterprise.

10 minutes

Mitotic Periodicity in Albino Rat Thyroid Epithelium

ARTHUR J. GATZ, Department of Microscopic Anatomy, Medical College of Georgia

Mitotic activity of thyroid epithelium was studied in immature and mature rats. Mitosis was practically non-existent in the adult thyroid follicles, even in material which had been treated with colchicine. However, cell divisions were abundant in the thyroids of rats ranging from one to thirty-five days of age sampled between the hours of 8:00 and 9:00 a.m. No secondary mitotic cycle has been observed thus far.

10 minutes 3¼ x 4 slides

Mitosis in the Rat Thyroid Following Administration of Propyl-Thiouracil

RONALD M. WILSON, Department of Microscopic Anatomy, Medical College of Georgia
(Introduced by Arthur J. Gatz, Medical College of Georgia)

Litter-mate, month-old, Sprague-Dawley rats were given propyl-thiouracil by intubation for a period of ten to eleven weeks. This drug had a marked effect on their growth after four weeks of treatment. Histological study of the experimental thyroids at the termination of the experiment revealed hyperemia, hypertrophy and hyperplasia of the follicular epithelium. The hyperplasia resulted from mitotic divisions which occurred primarily between 8:00 and 9:00 a.m. No cellular divisions were observed at 4:00 p.m., although some follicular epithelium was dividing at 2:00 p.m. No abnormal growths were observed in the gross or sectioned thyroid tissue.

10 minutes 3¼ x 4 slides

SECTION I

BUSINESS MEETING
ELECTION OF OFFICERS
DEMONSTRATION PAPERS

2:15-3:00 P.M.
206 Biology Building
Clyde Keeler, Chairman

ABSTRACT

Five Items in the History of Genetics and Evolution

CLYDE KEELER, Biology Department, Georgia State College for Women

1. The Effects of Isolation on Land Snails. Exhibit: a collection of land snails from isolated hummocks near Miami, Florida, showing the fixing of types by mutation and inbreeding. Collected by the demonstrator.
2. The Castle-Phillips test of Germ Cell Purity. Exhibit: stuffed skins from the original experiments, presented to the demonstrator by Prof. Castle.
3. Cuenot's Discovery of the First Lethal. Exhibit: two preserved, lethal yellow mice from the original experiments, presented to the demonstrator by Prof. Cuenot.
4. Kostoff's Demonstration of Cytoplasmic Effects. Exhibit: tumorous stems of incompatible tobacco hybrids, presented to the demonstrator by Prof. Kostoff.
5. Variability in bleeding tooth shells. Exhibit: bleeding tooth shells showing considerable variability within a single breeding group. Collected by the demonstrator.

Table

Reminders of the Scopes Trial at Dayton, Tennessee, 1925

WINTERTON C. CURTIS, Professor Emeritus of Zoology, University of Missouri, Columbia, Missouri
(Introduced by Elizabeth L. Sawyer)

Pictorial and other records of the historic Scopes trial have been assembled for display, including "Fundamentalism vs. Evolution at Dayton, Tennessee," published in 1956 by the demonstrator, one of the scientists at the trial.

Table

An Economical Apparatus for One-Dimensional Paper Chromatography

LILLIAN M. COWIE, Department of Biology, Wesleyan College

Paper chromatography has long been firmly established as a tool of analytical chemistry, having particular appeal for the detection of closely similar compounds found in biological materials. This paper demonstrates a very simple arrangement of chromatography, made from inexpensive materials which can be purchased in a hardware store.

The container is a tall, narrow trash can, while the trays for holding the developing solvent are of polyethylene. Protection from the solvent action of the developing solvents is obtained by using paraffin wax and polyethylene. Examples of results obtained using this apparatus are included for examination.

Table

SECTION II

CHEMISTRY

FRIDAY, APRIL 24, 1959 – 9:00 A.M.

102 Chemistry Building

L. W. Blitch, Presiding

The Stereochemistry of the Cycloheptane Ring. Synthesis and Deamination of *cis* and *trans*-2-Aminocycloheptanol

JOHN W. HUFFMAN and JOHN E. ENGLE, School of Chemistry, Georgia Institute of Technology

Cis and trans-2-aminocycloheptanol have been prepared by the route: cycloheptene oxide ⟶ trans-2-aminocycloheptanol trans - 2-(p-nitrobenzoylamino) cycloheptanol ⟶ cis-2-p-nitrophenyl-4, 5-cycloheptanoöxaoline ⟶ cis-2-aminocycloheptanol. Deamination of the trans isomer with nitrous acid gives cyclohexylmethanal, while the cis isomer affords cycloheptanone as the principal product. These results are compared with those obtained from cis and trans-2-aminocyclohexanol and are interpreted in terms of the rate of reaction versus the rate of reaction versus the rate of conformational change.

20 minutes 3¼ x 4 slides

An Introduction to the Heteropolyacids

WILLIAM H. WAGGONER, Department of Chemistry, University of Georgia

It has been one of the triumphs of modern coordination theory that it has been able to explain satisfactorily the structural and chemical features of many complex substances. Much of the work which constitutes the current revival of activity in the inorganic field is, in fact, directly concerned with such chemical complexes.

This paper reviews some of the developments which have led to the presently accepted status of one class of inorganic complexes, the heteropolyacids. The physical and chemical properties of some representative compounds are summarized. The importance of this class of complexes to analytical chemistry is noted. Several of the proposed structural theories are discussed and suggestions regarding potentially valuable areas for future investigation are made.

20 minutes

Nuclear Magnetic Resonance

EARL B. WHIPPLE, Emory University

The basic theory underlying the spin resonance phenomenon and certain applications of the data obtained to problems in chemical structure are discussed in terms of simple models. Several examples are taken from current research at Emory University.

20 minutes 3¼ x 4 slides

Microwave Spectroscopy

BARBARA B. STEWART, Emory University

Microwave spectroscopy of gaseous molecules at low pressure involves the rotational transitions of the molecule. From this rotational spectrum much valuable information about the structure and electronic con-

figuration of the molecule can be obtained. Planarity, bond lengths and angles can be determined as well as the dipole moment, barriers to internal rotation, and much about electron distribution and double bond character in the molecule.

20 minutes

The Use of Physical Constants in Analysis

T. H. WHITEHEAD, Department of Chemistry, University of Georgia

The usual methods of qualitative organic analysis are based upon classification by solubility groups and followed by specific reactions for each group with a final identification based upon a solid derivative. If the unknown is a mixture, it is usually essential to separate the components of the mixture before any definite identification can be made.

In recent years considerable progress has been made in the use of physical constants in the analysis of liquids. The constants most frequently used are refractive index and density, although boiling point has been used in some instances.

If plots are made of these constants using refractive indices on the vertical axis, one gets a series of curves which are characteristic of types of organic compounds (e.g. alcohols, ethers, hydrocarbons, etc.). Furthermore a mixture of two different types will often fall between the established curves, thus giving a good indication of what the mixture contains.

The laboratory work is simple; density is determined by standard procedures such as a specific gravity balance, and refractive index is determined by an Abbe or Zeiss immersion refractometer. Comparison is then made with established curves.

This procedure is very simple and rapid but appears to have been overlooked in spite of an excellent article published in Analytical Chemistry **22**, 892 (1950).

Typical curves will be shown by slides and their practical use discussed.

20 minutes

Tetraphenylboron for the Determination of Potassium

H. A. FLASCHKA, Chemistry Department, Georgia Institute of Technology

Theoretical background and practical application of the precipitation of postassium with tetraphenylboron are dealt with. Qualitative tests and quantitative determinations are described. The determination can be performed gravimetrically, titrimetrically or spectrophotometrically. Various methods are described. Interferences and limitations of the method are discussed.

40 minutes Blackboard

The Coulometric Titration of Manganese With Electrogenerated Vanadyl Ion

DONALD G. DAVIS, Georgia Institute of Technology

Electrogenerated vanadyl ion has been used as a titrant for the coulometric titration of manganese. The manganese was first oxidized with argentic oxide in nitric acid medium and then titrated coulometrically after dilution with 0.5 **F** sulfuric acid.

This titration is relatively free from interference. Of the metals normally found with manganese in alloy or other samples, only chromium causes interference. Attempts to eliminate this interference by variation of acidity were unsuccessful but, since the reaction between dichromate

and vanadyl ions is slow, fairly accurate titrations can be accomplished if the amount of chromium is small.

The end point of the titration was determined amperometrically using two similar platinum electrodes. The amperometric titration curve found varied considerably from the usual theoretical pattern but has been explained by reference to the appropriate current potential curves and by controlled potential electrolysis experiments. The existance of Mn (III) as an intermediate reduction product of the reaction between permanganate and vanadyl ions has been established.

15 minutes 3¼ x 4 slides

Section II

BUSINESS MEETING
ELECTION OF OFFICERS

Section III

EARTH SCIENCES

FRIDAY, APRIL 24, 1959 – 9:00 A.M.

314 Student Center

An Interpretation of Some Granite Contacts

WILLARD H. GRANT, Emory University

Detailed grain-size studies of two small granitic masses, near Emory University, show that the grain size tends to coarsen near the contact. This condition is opposite to that generally associated with igneous contacts. This effect is interpreted as being caused by contraction of the granitic mass on crystallizing with simultaneous expulsion of volatile-rich solutions which subsequently crystallize near the contact producing larger crystals.

10 minutes

Georgia Tech's Plan for the Application of Mineral Engineering and Mineral Economics to the Industrial Development of Georgia

JOHN E. HUSTED and ALFRED T. NAVARRE, Georgia Institute of Technology

The contribution outlines the approach of Georgia Tech towards the encouragement of industry within the state as it may be based on mineral resources.

15 minutes

Distinguishing Characteristics of Bentonites in Northwestern Georgia

ERNEST H. READE, JR., Emory University

The accessory minerals in the bentonites of northwest Georgia are chiefly brown biotite, quartz, feldspar, and zircon. Biotite is the only common megascopic mineral. The majority of the grains are anhedral;

however, biotite ranges from euhedral to anhedral and zircon is euhedral. In many instances zircon is doubly terminated.

Differential thermal analysis gives similar results for samples from widely scattered outcrops, suggesting compositional similarity.

10 minutes

Geology of Cloudland Canyon State Park Dade County, Georgia

M. G. CROFT, U. S. Geological Survey

Cloudland Canyon State Park, about 4 square miles in area, is 17 miles south of Chattanooga, Tenn., in the Paleozoic area of northwestern Georgia. The canyon, a gorge about 1,000 feet deep, is carved in the broad Lookout Mountain syncline, in gently dipping Carboniferous rocks. A geologic map and measured sections were made within the Park area. Measured sections of Mississippian limestone and shale, about 900 feet thick, include the St. Genevieve, Gasper, Golconda, Hartselle, Bangor, and Pennington formations. Unconformably overlying the Mississippian system are more than 900 feet of Pennsylvanian terrestrial and deltaic deposits, largely sandstone, shale, and coal. These deposits, all of the Lee group, include the Gizzard, Sewanee, Bonair, Vandever, and Rockcastle formations. A thick fanlike deposit of Recent alluvium lies at the mouth of Cloudland Canyon.

This work was done as part of the geologic and ground-water investigation of Dade County being made by the U. S. Geological Survey in cooperation with the Georgia Department of Mines, Mining and Geology.

10 minutes

A Study of Facies Change in Quartzite Lamar County, Georgia

A. A. ADAMS, Emory University

Extremely weathered quartzite, with average attitude E-W, 30°N, was sampled along strike in Lamar County, Georgia, near Barnesville.

Size analyses show that the quartzite grades from coarse to fine in both an easterly and westerly direction. This facies change might be explained by the assumption of a past river channel with coarse particles near its middle grading into finer particles toward its banks.

10 minutes slides

Topography and its Relationship to a Bauxite Deposit in the Andersonville District, Georgia

HARLAND E. COFER, American Cyanide Company

Drill hole records and subsurface stratigraphy are used to illustrate an apparent relationship between topography and aluminum concentration. A coincidence of paleotopography and present topography tends to indicate that both have a bearing on the formation of the bauxite deposit. Evidence of iron migration in the area of bauxite formation supports the theory of an epigenetic origin for the bauxite.

12 minutes 2 x 2 slides

Effects of Samarium Oxide on the Dielectric Properties of Barium Titanate

WILLIAM B. CAMPBELL, Georgia Institute of Technology

A study was made to determine the effects of impurity additions of samarium oxide and a rare earth oxide mixture on the dielectric properties of a barium titanate body. The principal methods of analysis utilized the "Q" factor as determined through standard x-ray diffraction procedures. The samarium oxide proved to have a definite effect on the dielectric constant, power factor, dielectric loss factor, and the crystal structure.

10 minutes Slides

Coronites Near Culloden

VERNON J. HURST and WILLIS A. HOLLAND, Georgia Geological Survey

Metadolerites in the Culloden area bear well-developed coronas of amphibole and garnet around pyroxene; and biotite and garnet around ilmenite. The pyroxene and labradorite are intensely clouded.

The metadolerites originated as mafic igneous rocks. The coronas and clouding are evidence of regional metamorphism at high temperatures (550-600°C.) under water-deficient conditions.

10 minutes

Needed Geochemical and Geophysical Studies in the Waycross-Valdosta, Georgia, Area

GLENN BURDICK and H. W. STRALEY, III, Georgia Institute of Technology

The Central-Georgia Uplift trends north-northwest across the eastern half of the Georgia coastal plain. The basement complex beneath the Gulf coastal plain rises northward from the Florida-Georgia boundary to its outcrop along the fall zone. The western branch of the Ocala Arch swings westward toward the Chattahoochee anticline (Decatur arch).

Between the three lies a semi-enclosed basin opening toward the westward. At its eastern end, conditions for the formation of unconformities must have been quite common during the Tertiary and perhaps as early as the Lower Cretaceous.

It is suggested that geochemical and geophysical investigations might disclose some structural and stratigraphic conditions beneath Tertiary formations. The configuration of the basement might be readily discovered by seismic studies. If the limestones are either free of ground water or saturated, it may be possible to determine the traces of some of the unconformities by the aid of gravitutional measurements interpreted by second-derivative methods. Geochemical studies may assist in correlation of formations and in establishing unconformities.

10 minutes 2 x 2 slides

The Mechanism of Bloating Granite

WILLIAM B. CAMPBELL, Georgia Institute of Technology

A particular granite of north Georgia has a property of bloating when heated. The mechanism and its cause are explained.

5 minutes Slides

Abrasion Study of Rocks from the Lookout Formation in Dade County, Georgia

JAMES M. FAGAN, Emory University

Sandstone and conglomerate samples from the lower Pennsylvanian Lookout formation were subjected to approximately 50 kilometers of similated stream abrasion in a rotating drum. Measurements of the roundness and sphericity were made at five kilometer intervals. The change in shape and roundness are dependent on: 1) distance of travel; 2) kind of rock; 3) size of the pebble; and 4) size of associated pebbles.

10 minutes

Limestones Exposed in the Withlacoochee River Valley, Georgia

CHARLES W. FORTSON, JR. and ALFRED T. NAVARRE, Georgia Institute of Technology

At least two limestones, the Suwanee and Tampa, of Oligocene and Miocene ages, respectively, are exposed along the Withlacoochee River and in nearby sink holes in Brooks and Lowndes counties, Georgia. The Suwanee limestone is a relatively pure, white calcareous formation almost unchertified and unfossiliferous in the area investigated. The overlying Tampa limestone is separated from the Suwanee by a yellowish colored phosphatic, silicious layer a few feetb thick. The Tampa is an impure limestone commonly having angillaceous and cherty facies. Its upper levels are thoroughly brecciated and silicified and locally phosphatic. It is commonly separated from the overlying mottled Hawthorn formation (Miocene) by a layer of variable thickness of white sand mixed with fullers earth and/or kaolin.

Except for local undulations and slumps, the beds dip slightly to the south.

10 minutes 2 x 2 slides

Ground-Water Investigations Add to Our Knowledge of Geology

J. T. CALLAHAN, U. S. Geological Survey

Ground-water investigations in Georgia continue to add to our knowledge of the geology of the State. Made in cooperation with the Georgia Department of Mines, Mining and Geology or as Federal projects, the investigations have resulted in several publications which contain (a) geologic maps, (b) descriptions of measured sections and well logs, (c) isometric projections showing Coastal Plain stratigraphy, (d) paleontologic and mineralogic descriptions, and (e) geochemical and geophysical data and interpretations.

Projects under way in 1959 will result in publication of reports on areas in all three rock provinces, the Paleozoic sedimentary rocks, the Piedmont crystalline rocks, and the Coastal Plain sediments. Included in the projects are (a) geologic and ground-water reports on Dade and Catoosa counties, where detailed studies of the Knox dolomite are under way; (b) a geologic reconnaissance of the crystalline rocks and detailed studies of the depth and composition of saprolite in Dawson County; (c) geologic mapping and stratigraphic studies of Paleocene and Eocene sediments in southwestern Georgia; (d) detailed stratigraphic studies of several counties in Coastal Georgia in connection with problems of salt-water encroachment; and (e) a bulletin containing more than 300 well logs which contain descriptions of the lithology and microfauna of Coastal Plain sediments.

Continuation of geologic studies in connection with ground-water

studies will provide information that is useful not only for ground-water development, but also for the exploitation of nonmetallic mineral resources, highway planning, and other programs requiring geologic information.

15 minutes

An Unusual Occurrence of Gypsum Crystals

CHARLES GARDNER and WILLARD H. GRANT, Emory University

Gypsum crystals occur as an efflorescence on broken rock and as a mud on the floor of an old mine adit on the Yahoola River near Dahlonega, Georgia. The crystals being most abundant near the intersection of the adit and weathered rock, where there are small amounts of pyrite, it is inferred that the gypsum forms from a reaction between sulphate derived from pyrite weathering, and lime in the ground water.

Eh and Ph measurements suggest that this gypsum is formed in an ordinary oxidizing environment.

10 minutes

Metallic-Looking Object Reported to Have Fallen from the Sky Near Waycross

WILLIS A. HOLLAND and VERNON J. HURST, Georgia Geologic Survey

In March, 1953, Mr. Willis Steedley and a companion of Waycross, while hunting at night on the edge of Okefenokee Swamp, observed a brilliant flash and heard sounds which caused them to believe that an object had fallen out of the sky nearby. The following day they returned to the site and found a freshly burned area in which there was a hole about 2 ft. deep in the ground. From the bottom of this hole they obtained two dark, metallic-looking fragments, one weighing 8 oz., the other 7 lbs. 2 oz., which appear to be about one-third of the object before it was broken.

The fragments are composed primarily of very fine-grained pyrite and calcite. Spectrographic analyses give less than .005% cobalt and vanadium and 0.0146% nickel in the core; greater amounts of vanadium and cobalt but still less than .005%, and 0.0277% nickel in the rim. Mineralogically the object is unlike anything previously known to have fallen from the sky. It resembles more a concretion. If it is a concretion, explanation is lacking for its unweathered condition and the absence of other concretions in the area.

10 minutes

Contact Relations of the Providence and Ripley Formations

J. K. SMALLWOOD, Emory University

The Perote (basal member of the Providence sand) unconformably (?) overlies the Ripley formation and is separated from it by a sandstone layer approximately three feet thick. Lithologic study shows that they are similar, with both containing quartz, mica, and some lignite. Quartz is most abundant. Grain size seems to be the same, except that the Perote contains a few coarser grains.

The area covered by this paper lies in and around the Providence Canyons.

10 minutes

Thorium Oxide Cleavage

WILLIAM B. CAMPBELL, VERNON J. HURST* and WILLIS E. MOODY,
*Georgia Geologic Survey and
Georgia Institute of Technology

The procedure and methods used to determine the cleavages in synthetic thoria crystals is described and experimental data is presented.

5 minutes

A Heavy Mineral Study of Portions of Peachtree Creek-South Fork and Peavine Creek

WALTER L. SANDLIN, JR., Emory University

The heavy mineral suites of a portion of Peachtree Creek-South Fork and a deltaic deposit of Peavine Creek near its intersection with South Fork in DeKalb County, Georgia are discussed. Percentage of heavy minerals are given, contrasting the provenance of the sedimentary deposits of both streams. Observations are made on the constancy of occurrence of heavy minerals in separated samples of the same stream.

5 minutes

A Natural Example of the Pyrite ——→ Pyrrhotite + Sulphur Reaction

VERNON J. HURST, Georgia Geologic Survey

Nearly all the granite-gneisses in Georgia contain small crystals of accessory pyrite. Anomalously, the gneiss at Holton, Bibb County, contains small black grains which are a mixture of pyrrhotite and sulphur. The composition of the pyrrhotite, determined by measuring d_{102}, is about 60 weight percent iron.

Pyrite heated to 743°C at 180 p.s.i. melts incongruently to pyrrhotite plus a liquid whose composition is close to pure sulphur. The melting temperature is raised slightly by increasing pressure, being 770°C at 30,000 p.s.i. This is the pressure at a 4-5 mile depth. Pyrrhotite formed by the breakdown of pyrite at high pressure has about 60 weight percent iron.

The pyrrhotite-sulphur grains in the gneiss at Holton probably represent pyrite crystals which have been heated to at least 700°C. The possibility is being investigated of drawing an isotherm on the Piedmont by tracing this breakdown of pyrite.

8 minutes

Section III

BUSINESS MEETING

ELECTION OF OFFICERS

Section IV

PHYSICS, MATHEMATICS, ENGINEERING

FRIDAY, APRIL 24, 1959 – 9:00 A.M.

101 Physics Building

W. A. Calder, Presiding

Some Properties of Thin Films Formed by Vaporization of Metallic Oxides *in Vacuo*

J. CONRAD MEADERS and RICHARD B. BELSER, Georgia Institute of Technology

Fourteen metallic oxides were vaporized at a pressure of 2 x 10^{-5}mm of mercury and were collected as films on clean glass microscope slides. Several of the films exhibited a metallic appearance at the film-glass interface, and interference colors at the outer surface typical of thin transparent layers. Electrical contacts to films of Co_3O_4, CuO, γFe_2O_3, MgO, NiO, and ZnO were made by an indium solder technique. The resistances of these films were measured and were found to have values between 182 ohms and 5 megohms. Other films had unmeasurably high resistances. Subsequent annealing of some films at 450°C in vacuo caused resistance drops of up to 99%. Films of γFe_2O_3, CuO, NiO, and Co_3O_4 exhibited resistance drops, but those of Cr_2O_3, CaO, ZnO, WO_3, and MgO did not. Curves of resistance vs. temperature were plotted for a number of films in the range of 21°C to 113°C. Films of γFe_2O_3 and NiO had positive temperature coefficients, whereas those of CuO, MgO and ZnO had negative coefficients. Visual, electrical resistance, and electron diffraction evidences indicated that materials deposited by vaporization of the oxides γFe_2O_3, NiO and Co_3O_4 were partially reduced and were composed of the respective metal and one or more oxides, whereas the remainder of those tested were not.

10 minutes 3¼ x 4 slides

A Simple Time Base Generator for Sequence Control Applications

W. B. MILLER, JR. and J. W. CHIDSEY, JR., Department of Radiology, Emory University School of Medicine

In measurements of certain phenomena it is necessary to record the data by use of sampling technique. For accuracy the sampling rate must be rapid and rigorous. For convenience it is well to use the 60 cycle line frequency as a standard and to derive from this the interval pulses for control of the sequencing operation. This paper describes the development of such a system for accurately timed intervals of no less than 16 milliseconds, utilizing a pulse generator controlled by the 60 cycle line frequency and binary scaler time interval divider.

This work supported by grant from U. S. Health Service, National Institute of Health.

10 minutes

A Sensitive Gamma-Ray Dosimeter

B. L. BLANKS and R. H. ROHRER, Departments of Radiology and Physics, Emory University

A sensitive gamma-ray dosimeter for use both in phantom materials and in body cavities is described. A one-quarter inch diameter light pipe of lucite assures a maximum transfer of light from a small scintillator to a 1P21 photomultiplier tube. Errors due to the scintillation of the lucite and due to the current generated by direct gamma irradiation of the photomultiplier tube are cancelled by the use of a light chopper between the scintillator and the light pipe. Pulse amplifier and detection circuits are also outlined.

The instrument is suitable for dosimetry over a range from 100 mr/hr to 100r/min. The maximum sensitivity of the device is about 10 times better than that of systems which use a hollow aluminum tube for a light pipe.

This research supported by the U. S. Atomic Energy Commission.

15 minutes 2 x 2 slides

Remotely Operated Systems for Radiation Dose Measurements

B. L. BLANKS, J. W. CHIDSEY, JR., H. J. FULLBRIGHT, and W. B. MILLER, JR., Radiology Department, Emory University School of Medicine

In therapeutic radiology, such as cancer therapy employing a Co-60 gamma emitter, it is necessary for the radiologist to know the intensity of radiation at various loci within the patient. To obtain this information a water tank is used to simulate the patient and a radiation detector is placed at various positions in the tank to measure the radiation at that point. Due to the high radiation level in the treatment room, it is necessary to remotely position the detector from another room.

Such a remotely operated device has been designed and constructed utilizing a d. c. servo system equipped with d. c. servo motors with magnetic brakes. The electrical and mechanical design considerations are presented and also, a few of the radiation contours obtained with it.

This work supported by grant from the Atomic Energy Commission.

10 minutes 2 x 2 slides

Comparison of Theory and Experiment on Scattering of 80 KVP X-Rays by Light Elements

H. D. YOUMANS, JR., Radiology Department, School of Medicine, Emory University

This department has been engaged in studying the quantities and qualities of secondary x-rays incident on the gonads during diagnostic x-ray procedures. In the course of this investigation a scintillation spectrometer has been employed to measure the primary and secondary x-ray spectra from light elements such as compose the human body. The method of Owen and Primakoff has been employed for correcting the measured spectra for the Gaussian resolution of the spectrometer. In 1954 Lindell published a theoretical survey on secondary x-radiations which includes a formulation of the scattering system usually encountered in a medical x-ray department. We have obtained resolution corrected spectra using the 80 KVP bremsstrahlung from a tungsten target which had been filtered by 3.0 millimeters of aluminum. These spectra demonstrate the first order validity of Lindell's theory for broad

beam geometry. The spectra show the predominance of Compton interactions and dependence on scattering angle.

This work supported by grant from the U. S. Public Health Service, National Institute of Health.

10 minutes

The Van de Graaff Generator at Mercer University

P. D. BUSH, JR. and PHILLIP STEWART CURTIS, Mercer University

The materials that are needed are a wooden platform, an electric motor, a copper sphere, a rubber belt, an electric generator, two idle wheels, and three dielectric supports.

The platform is three feet long, two feet wide, and two inches thick. The sphere is mounted three feet above the platform on three glass rods which are each a meter long. The rubber belt is six feet long. The electric motor runs at 3500 revolutions per minute. The electric generator provides a potential difference of 150 volts D. C.

The principles involved in the operation of the Van de Graaff Generator are covered in the paper.

10 minutes

A Giant Step Forward

P. D. BUSH, JR., ARTHUR C. BAILEY, JR., and DAVID EWING, Mercer University

The basic qualification of a good Physics Department is a modern, well equipped building. The Mercer Physics Department did not have a building of this type. For many long years the hope of a new building had been a dream. With the advent of Mr. James E. Martin, an explosion, and the consequent results, this dream became reality in August of 1958.

The physics building now in use at Mercer is of modern brick construction, which fulfills all the requirements of a well-balanced physics center. Also, it enhances the appearance of the Mercer campus.

This new building means a great deal to Mercer and to Mercer's environment. With this modern building in use, Mercer can offer a physics major that can equal a major from any school of its kind in the United States.

10 minutes

Space Travel and Rocketry (A Demonstration Lecture)

E. A. CUSHMAN, Traveling Science Teacher, Georgia Department of Education

30 minutes

The Performance of CdS Photocells as High Level Radiation Monitors

H. J. FULLBRIGHT, III and B. L. BLANKS, Departments of Radiology and Physics, Emory University

A commercially available cadmium sulfide photocell is in use as a monitor of radiation from a 160-curie cobalt-60 source of gamma-rays. The sensitive area of the cell is about one square centimeter. A zinc sulfide screen placed over the light sensitive surface improves the response. In a circuit operating at a potential of twelve volts a current of

40 microamperes is obtained at a distance of 8 cm from the source. The stability of this monitor under long irradiation exposures is under observation. The responses of several types of photocells will be compared.

This work is supported by the U. S. Atomic Energy Commission.

10 minutes 2 x 2 slides

What Physicists Should Know About Spilled Radium

R. H. ROHRER, Departments of Radiology and Physics, Emory University

The experiences of a physics group faced with the responsibility of evaluating the hazard caused by a radium spill in an Atlanta hospital and of removing the contamination will be recounted. The nature of the contents of medical and industrial encapsulated radium containers and their weaknesses will be discussed. The paper includes a review of the precautions required when dealing with radium contamination and recommendations for those who might be called upon in an emergency to assist in similar situations.

15 minutes 2 x 2 slides

Debye Temperatures from the Temperature Dependence of X-Ray Reflections

R. A. YOUNG, Engineering Experiment Station, Georgia Institute of Technology

The formula of the structure factor, F, to which diffracted X-ray intensity is related contains a factor exponential in B, the X-ray temperature factor. B is related to the mean square displacements of the atoms, $\overline{u^2}$, and to the Debye temperature, by the widely known Debye-Waller formula.

B is ordinarily determined by detailed intercomparison of the relative intensities of many reflections (from the same crystal) at one temperature. For favorable cases of monatomic and NaCl type structures at one temperature, it is relatively easy to determine B values as a function of atom type and as a function of crystallographic direction. The accuracy of such determination is necessarily limited by the accuracy with which the relative intensity measurements may be made. It frequently may be possible to measure the change of intensity of a given reflection as a function of temperature with better accuracy than the relative intensities of two or more reflections might be measured. A procedure for determining B which takes into account an assumed form of the temperature variation of the Debye temperature will be presented. The input data for this procedure are the changes of intensity with temperature of one or more reflections.

10 minutes

Section IV

BUSINESS MEETING

ELECTION OF OFFICERS

Section V

PSYCHOLOGY AND MEDICINE

FRIDAY, APRIL 24, 1959 — 10:00 A.M.

304 Student Center

Mental Health in Georgia

General Chairman: PASQUALE E. MAFFEE, Mercer University

10:00 a.m.—Part I: Symposium

The Georgia Workshop on Mental Health Problems
Participants: Drs. Glenn Woolf, Rohrer, Hibler and Raplogle

Drs. Robert Blake, Rohrer, Hibler, and Raplogle
Dr. Florene Young, Chairman, University of Georgia

11:00 a.m.—Part II: Invited Speaker

"The Future of Mental Health in Georgia"
The Honorable Peyton S. Hawes
Member Georgia General Assembly and President of the Georgia Association for Mental Health

Section V

BUSINESS MEETING

ELECTION OF OFFICERS

Section VI

PHILOSOPHY AND HISTORY OF SCIENCE

FRIDAY, APRIL 24, 1959 — 9:00 A.M.

316 Student Center

James A. Gould, Presiding

"Skinner and the Role of Teaching Machines"

Rubin Gotesky, University of Georgia

A discussion of the importance of some unexplored problems concerning Skinner's conception of the role of teaching machines in the learning process.

"A Philosopher and Naturalist Looks at Nature"

Charles Hartshorne, Emory University

Today in the United States many philosophers call themselves naturalists. They are not so much interested in nature as they are in anti-supernaturalism. The author of this paper is a supernaturalist interested in nature. This paper explains and defends the latter position.

"Education: the Individual and the Community"

Professors Ladd, Bohnhorst, and Seward

A basic problem facing education is whether education should be di-

rected towards individual's needs and abilities, or towards an equal level of education for all.

1. Professor Ladd—"The Problem."
2. Professor Bohnhorst—"Instrumentalism and Learning."
3. Professor Seward—"Instrumentalism and the Community."

Section VI

BUSINESS MEETING

ELECTION OF OFFICERS